DAY 14

MCA CET 2025

MATHS

QUADRATIC EQUATIONS

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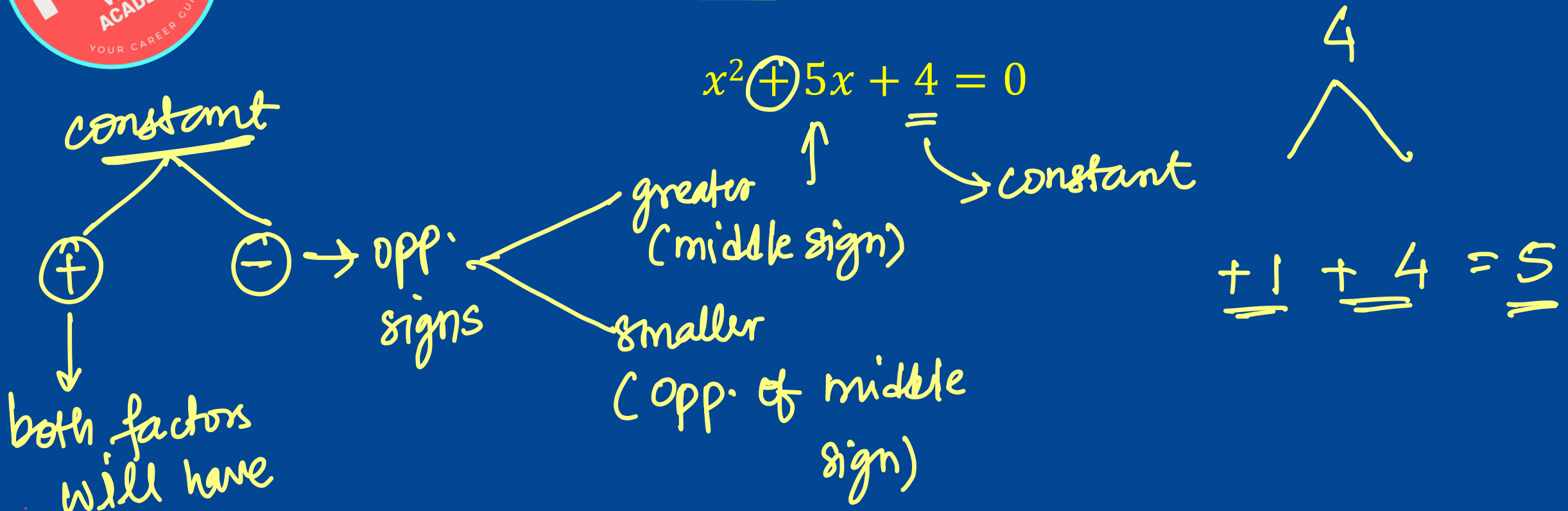
Quadratic Equations

$ax^2 + bx + c = 0$ (where $a \neq 0$)

$bx + c = 0 \Rightarrow$ linear

Solving Quadratic Equations

Method 1: Factorization



Solving Quadratic Equations

Method 1: Factorization

$$x^2 + 5x + 4 = 0$$

+4

+1 +4

$x^2 + 1x + 4x + 4 = 0$

$x(x+1) + 4(x+1) = 0$

$(x+4)(x+1) = 0$

$x + 4 = 0$ or $x + 1 = 0$

$x = -4$ or $x = -1$

Solving Quadratic Equations

Method 1: Factorization

$5x^2 + 8x - 4 = 0$

$5x - 4 = -20$

$5x^2 + 10x - 2x - 4 = 0$

$+10 \quad -2$

$5x(x+2) - 2(x+2) = 0$

$(5x-2)(x+2) = 0$

$5x - 2 = 0$ or $x + 2 = 0$

$x = \frac{2}{5}$ or $x = -2$

Solving Quadratic Equations

Method 2: Sridharacharya's Method (Formula Method)

$ax^2 + bx + c = 0$

$3x^2 + 12x - 4 = 0$

$a = 3$	$b = 12$	$c = -4$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-12 \pm \sqrt{144 + 48}}{2 \times 3} = \frac{-12 \pm \sqrt{192}}{6}$$

$$x = \frac{-12 \pm 8\sqrt{3}}{6} = \frac{-6 \pm 4\sqrt{3}}{3}$$

$$x = \frac{-6 + 4\sqrt{3}}{3}$$

$$x = \frac{-6 - 4\sqrt{3}}{3}$$

Discriminant ($b^2 - 4ac$) $= \Delta$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Important Notes:

$$\Delta = b^2 - 4ac = \begin{cases} > 0 & \text{two real unequal roots.} \\ = 0 & \text{two real equal roots.} \\ < 0 & \text{two unreal unequal roots. (imaginary)} \end{cases}$$

Important Points

$ax^2 + bx + c = 0$

$\alpha \quad \frac{1}{\alpha}$

1. reciprocal roots, if a = c.
2. one root = 0, if c = 0.
3. negative and reciprocal roots, if c = - a.
4. both roots equal to 0, if b = 0, c = 0.

Roots = (α, β)

If roots of QE are known

$ax^2+bx+c=0$

1. $\alpha+\beta = \frac{-b}{a}$

2. $\alpha\beta = \frac{c}{a}$

3. Quad. Eqn $\Rightarrow$ $x^2-(\alpha+\beta)x+\alpha\beta=0$

α, β.

Important note if roots are known

If the equation $ax^2 + bx + c = 0$ has the roots α and β,

then the equation having the roots $\frac{1}{\alpha}$ and $\frac{1}{\beta}$,

is $cx^2 + bx + a = 0$.

3, 2

$\frac{1}{3}, \frac{1}{2}$

Which of the following is a quadratic equation?

(a) $x^3 - x^2 - x + 5 = 0$

(b) $x^4 - 10 = 0$

(c) $7x^2 = 49$

(d) $x^4 - x^3 = 9000$

H.P = 2

Find the roots of the quadratic equation

$6x^2 - 11x - 35 = 0$.

$a = 6 \quad b = -11 \quad c = -35$

(a) $\frac{5}{3}, \frac{-7}{2}$

(b) $\frac{-5}{3}, \frac{7}{2}$

(c) $\frac{-3}{5}, \frac{2}{7}$

(d) $\frac{3}{5}, \frac{-2}{7}$

$4ac \quad 140$

$4 \times 6 \times 35$

31

$$x = \frac{11 \pm \sqrt{121 + 840}}{12} = \frac{11 \pm \sqrt{961}}{12} = \frac{11 \pm 31}{12}$$

$$x = \frac{11 + 31}{12} = \frac{42}{12} = \frac{7}{2}$$

$$x = \frac{11 - 31}{12} = \frac{-20}{12} = \frac{-5}{3}$$

If the roots of the equation $px^2 + x + r = 0$ are reciprocal to each other, then which one of the following is correct?

(a) $p = 2r$ (b) $p = r$

(c) $2p = r$ (d) $p = 4r$

$\alpha \quad \frac{1}{\alpha}$

$ax^2 + bx + c = 0$

If one root of the quadratic equation $ax^2 + bx + c = 0$ is the reciprocal of the other, then which of the following is correct?

(a) $b = c$

(b) $ac = 1$

(c) $a = c$

(d) $a = bs$

$\alpha \quad \frac{1}{\alpha}$

The multiplication of two consecutive odd numbers is 6723, then square root of the smaller number is

(a) 91 (b) 729

(c) 7 (d) 9

3	6723
3	2241
3	747
3	249
	83

(x) $(x+2)$

$x(x+2) = 6723$

$x^2 + 2x - 6723 = 0$

81

$3 \times 3 \times 3 \times 3$ 83

$= 6723$

If α, β are the roots of the equation $2x^2 - 3x + 2 = 0$, then the value of $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ is = ?

(a) $\frac{45}{16}$ (b) $\frac{9}{8}$ (c) $\frac{2}{7}$ (d) $\frac{8}{9}$

$\alpha + \beta = \frac{-b}{a} = \frac{-3}{2}$

$\alpha\beta = \frac{c}{a} = \frac{2}{2} = 1$

$\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3 + \beta^3}{\alpha\beta} = \frac{(\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)}{\alpha\beta}$

$= \frac{\left(\frac{-3}{2}\right)^3 - 3 \times 1 \left(\frac{-3}{2}\right)}{1} = \frac{-27}{8} + \frac{9 \times 4}{2 \times 4}$

$= \frac{-27 + 36}{8}$

$= \frac{9}{8}$

The sum of the reciprocals of the roots of the equation $abx^2 = (a^2+b^2+2ab)(x-1)$ is

(a) $\frac{2}{3}$ (b) $\frac{1}{2}$ (c) 2 (d) 1

$\alpha\beta$

$\frac{1}{\alpha}+\frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta}$

$\alpha+\beta = \frac{-b}{a}$

$abx^2 = (a^2+b^2+2ab)(x-1)$

$= (a^2+b^2+2ab)x = (a^2+b^2+2ab)(1)$

$abx^2 - (a^2+b^2+2ab)x + (a^2+b^2+2ab) = 0$

$\frac{\alpha+\beta}{\alpha\beta} = \frac{+\frac{(a^2+b^2+2ab)}{ab}}{\frac{a^2+b^2+2ab}{ab}} = 1$

If one root of the equation $\frac{x^2}{a}+\frac{x}{b}+\frac{1}{c}=0$ is reciprocal of the other, then which one of the following is correct?

(a) $a=b$ (b) $b=c$

(c) $ac=1$ (d) $a=c$

$\alpha, \frac{1}{\alpha}$

$a=c$

$ax^2+bx+c=0$

$a=\frac{1}{a}$ $c=\frac{1}{c}$

$\frac{1}{a}=\frac{1}{c} \Rightarrow a=c$

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